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Magnetopause Surface Reconstruction from Tangent Vector Observations

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Abstract Text:

Entire fields of science, most notably in astrophysics, rely on line-of-sight observations. In planetary science and heliophysics, the techniques of soft X-ray and energetic neutral atom (ENA) imaging also produce line-of-sight measurements. An important question is whether the geometry of the surface, for example the magnetopause, can be reconstructed using only line-of-sight observations from a single spacecraft. Under a broad range of conditions, the peak emission corresponds to the tangent to the boundary surface, such as the planetary surface or magnetopause, the so-called "limb brightening" phenomenon. Thus, line-of-sight observations frequently provide information concerning the tangent to the surfaces being observed. We present an algorithm to reconstruct the cross-section of the magnetopause using line-of-sight soft X-ray observations (and, in principle, ENA observations). The algorithm successfully reconstructs the cross section of the magnetopause in the orbit plane. The three-dimensional magnetopause structure can be recovered from observations by a spacecraft whose orbit precesses around the magnetosphere.

Session Selection:

Imaging the Global Dynamics of the Solar Wind - Magnetosphere Interaction

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Abstract Title:

Magnetopause Surface Reconstruction from Tangent Vector Observations

Requested Presentation Type:

Assigned by Program Committee (oral or Poster)

Previously Published?:

No

AGU On-Demand:

Yes

Abstract Payment:

Paid (agu-fm18-443363-2111-0143-5327-5882)

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